CLAIMS

1. A beam forming method for a smart antenna, which comprises:

implementing pre-multibeam processing and time delay aligning to array signals;

calculating a suboptimum weight by means of a pilot frequencysymbol;

iteratively calculating an optimum weight by means of said suboptimum weight as an initial value;

forming a beam by means of said optimum weight.

2. The beam forming method for a smart antenna according to claim 1, wherein, said step of implementing pre-multibeam processing to array signals comprises:

generating a number of fixed beams covering a sector, and implementing beam forming to the data received by an array, by means of said fixed beams;

implementing beam time delay searching to the generated beam domain signals, selecting the maximum beam of each multiple paths, and aligning the array data by means of the time delay value of this beam.

3. The beam forming method for a smart antenna according to claim 2, wherein, the coverage area of the beam and the amount and the width of the beam can be adjusted with the size of the sector to ensure all the directions of arrival of the mobile stations in the sector are included within said pre-multibeam.

4. The beam forming method for a smart antenna according to claim 1, wherein, said step of calculating the suboptimum weight comprises:

spreading and scrambling the known pilot frequencybits of the first interval of a current frame, as a reference signal;

based on the minimum mean square error rule, calculating the approximate solution of the correlation matrix of said reference signal and the array received signals after time delay aligning, as the

suboptimum weight.

5. The beam forming method for a smart antenna according to claim 1, wherein, said step of iteratively calculating the optimum weight comprises:

forming beams for the array received signals after time delay aligning, by means of the initial weight;

implementing descrambling and de-spreading to the received signals after beam forming, and determining control information;

re-spreading and scrambling the determined control information, as an iteration reference signal;

calculating iteration error by means of the iteration reference signal and the received signals after beam forming;

calculating a new weight;

iterating based on the new weight as the initial weight.

6. The beam forming method for a smart antenna according to claim 5, wherein, when calculating the new weight, an iteration formula $W_{i+1} = W_i + \mu \cdot X \times E^H$ is used, wherein, W_i is the weight calculated by last iteration, $\mu$is the step length of the iteration, E is the iteration error, E^H is its conjugate transpose, r is the iteration reference signal, Y is the received signals after beam forming.

7. The beam forming method for a smart antenna according to claim 5, wherein, in said step of determining, the information of a known pilot frequency bit serves as the determined output during the pilot frequency bit.

8. The beam forming method for a smart antenna according to claim 5, wherein, before the step of forming beams by means of said optimum weight, said method further comprises:

determining whether the iteration error meets requirement;

if the iteration error does not meet requirement, repeating said step of calculating the suboptimum weight and said step of iteratively calculating

the optimum weight.

9. The beam forming method for a smart antenna according to claim 8, wherein, said step of determining comprises:

calculating the mean square value of the iteration error;

if the calculated mean square value of the iteration error is larger than a predetermined threshold, determining that the iteration error does not meet requirement, otherwise determining that the iteration error meets requirement.

10. The beam forming method for a smart antenna according to claim 8, wherein, the optimum weight obtained in the first interval of each frame serves as the optimum weight of the whole frame to process the signals of all the intervals of the frame.

11. A beam forming apparatus for a smart antenna, which comprises:

a space domain forming module for implementing beam forming to the signals received by an antenna array, and said space domain forming module further comprises a pre-multibeam time delay searching unit for implementing pre-multibeam processing and time delay aligning to array signals;

a time domain processing module for obtaining the transmitted data based on the signals beam-formed by said space domain forming module; and

a re-spreading and iterating module for generating a reference signal based on the data information acquired by said time domain matched filtering module, calculating the iteration error and feeding it back to said space domain beam forming module.

12. The beam forming apparatus according to claim11, wherein, said space domain forming module further comprises:

a weight updating unit for calculating weights used for beam forming by means of the iteration error fed back from the re-spreading and iterating module;

multipliers for multiplying the corresponding weights calculated the weight updating unit and the received signals of the elements of the corresponding antenna array; and

an adder for adding the output of the multipliers.

13. The beam forming apparatus according to claim11, wherein, said time domain processing module comprises:

a descrambling and de-spreading unit for descrambling and de-spreading the signals beam-formed by the space domain forming module;

a RAKE incorporating unit for incorporating the signals of multiple paths; and

a determiner for determining the data to be transmitted from the signals after the RAKE incorporating.

14. The beam forming apparatus according to claim11, wherein said re-spreading and iterating module comprises:

a re-spreading and scrambling unit for re-spreading and scrambling the transmitted data obtained by said time domain processing module, as an iteration reference signal;

an iteration error computing unit for calculating the iteration error based on the iteration reference signal from said re-spreading and scrambling unit and the received signals beam-formed by said space domain forming module.

15. The beam forming apparatus according to claim14, wherein, said weight updating unit of the space domain forming module iteratively calculates an optimum weight by means of the iteration error calculated by the iteration error computing unit.

16. The beam forming apparatus according to claim15, wherein, said weight updating unit of the space domain forming module calculates the cross correlation matrix of the spreading and scrambling signals of the known pilot frequency bit and the received pilot frequency range signals, based on the minimum mean square error rule to obtain a suboptimum weight, as the initial value of iteration calculating.

17. The beam forming apparatus according to claim16, wherein, said weight updating unit re-calculates the suboptimum weight when it is determined that said iteration error does not meet requirement.

18. The beam forming apparatus according to claim14, wherein, said

iteration error computing unit regards the signal spread and scrambled by means of a known pilot frequency bit as the iteration reference signal during pilot frequency bits.

19. A smart antenna, which comprises an antenna array composed by elements and the beam forming apparatus of claim 11-18.